

## A Five-Year Fire Incidents Data Analysis in the City of Ozamiz

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### ABSTRACT

Fire incidents in any cause may lead to a devastating effect to the community or family where the fire incident happens. It is considered as an accident that could destroy properties of the family in a very short period of time. This study determined the five-year trend analysis of fire incidents in Ozamiz City using the available historical data from 2016-2021. The study employed retrospective method of research. Since it is a retrospective study, the result of interest has already occurred, and the data obtained is from records, no volunteers will be used in this study. However, the Bureau of Fire Protection Officers of Ozamiz City will offer the study's relevant data. According to the findings, electrical related fire incidents are the most common cause of fire in Ozamiz City, whereas LPG related fires are the least likely to cause fires. It is suggested that Ozamiz City's Bureau of Fire Protection hold monthly lectures or programs on fire safety and prevention in the community. Ozamiz City residents should exercise caution when leaving their homes and avoid using the octopus connection to avoid power outages. Furthermore, staff from Ozamiz City's Bureau of Fire Protection should conduct more frequent fire inspections in the city's businesses.

**Keywords:** Archival, Chemical reaction, Electrical, Fire incidents, Lighted cigarette, Open flame, LPG.

### 1. Introduction

Fire is the evident product of the combustion process which is a specific type of chemical reaction (Brown, 2020). It transpires whenever the presence of oxygen in the atmosphere collides with some form of energy or fuel (Biswas & Pal, 2020). The byproducts of the chemical reaction are completely contradictory from the initiating substance (Pauli, 2021). For combustion to take place, the fuel must be heated to its ignition temperature. As long as there is enough heat, fuel, and oxygen, the reaction will continue (Guo et al., 2020).

Whether in the natural and physical world or when deliberately or incidentally lit, fire has both tremendous destructive and enabling properties (Cabañas & Escabel, 2017). Humans revolutionized the concept of ecosystem fire, modifying the environment to better suit their needs and lifestyle (SEOSAW partnership, 2021). Thus, fire provides numerous benefits and essential convenience for humans (Mazari et al., 2021). Fire yields heat and light which enables humans to acquire sustainability on a daily basis (Nashalian & Chen, 2020). On the contrary, when left unattended, fire can and has resulted in massive destruction, damage, and loss of life (Zou et al., 2020).

Fire incidence have two main causes: natural and human-caused (Vega, 2021). There are two major causes of human-related incidence: accidental and intentional (Rodrigues & de la Riva, 2020) but it has only one implication which is property damage. As a matter of fact, 2019-2020 Australian Bushfire Season, also known as the Black Summer, was a time of extremely violent bushfires in several parts of Australia (Abram et al., 2021).

As mentioned by the Center for Disaster Philanthropy (2019), the first substantial bushfires erupted even before spring officially arrived in June, and additional out-of-control fires erupted at the beginning of September 2019. With rising temperatures and a lengthy drought, the fire situation deteriorated substantially at the start of November 2019. Over the first weekend in February, the catastrophic situation was exacerbated by higher temperatures, drought, and high winds. Firefighters were able to put out all of the flames in New South Wales (NSW) in

mid-February, despite the fact that fires continued to burn in Victoria. By March 4, 2020, all of the fires had been smothered or contained - nine months after the first ones started to burn.

In addition to the given information, it was reported that the bushfires scorched more than 46 million acres (72, 000 square miles), an amount approximately equal to Syria's whole country. Between September 2019 and March 2020, thousands of flames destroyed at least 3,500 homes and thousands of other structures, killing 34 people (Beeson, 2020). The majority of the fatalities and property damage occurred in New South Wales (NSW), with the Northern Territory accounting for around a third of the total scorched area. At least 80% of the Blue Mountains World Heritage Area in NSW was burned, as were 53% of the Gondwana World Heritage Rainforest in Queensland (QLD) (Matthews, 2020). Many of the other structures that were destroyed were farm structures, complicating the already difficult task of agricultural recovery, which is complicated by ash-covered terrain and severe drought levels.

Meanwhile, Philippines continues to be plagued by devastating fires, along with some of the worst disasters in history (Kelman, 2020). As indicated by the IFSEC Philippines (2021), a fire broke out at the Kentex Manufacturing factory in Valenzuela City on May 13, 2015, killing 74 persons who were trapped inside the blazing shoes-and-slippers factory. After the 1996 Ozone Disco Club fire, which killed 162 people, and the 2001 Manor Hotel Fire, which killed 75 people, this is the Philippines' third worst fire disaster. Buildings were completely burned or destroyed in all three cases, tremendous quantities of cash were lost in a matter of hours, and those who were fortunate enough to escape and survive endured the misery of losing their jobs, their source of income, and their way of life (IFSEC Philippines, 2021).

Fires are one of the few disasters that can be prevented and mitigate to some extent (Parida et al., 2021). Authorities, private and public enterprises have used fire preventive measures, fire suppression plans, and fire drills to avoid fires, reduce casualties, and lower the cost damage (Reichert, 2021). Furthermore, the implementation of PD 1185, or the Philippine Fire Code, which was amended by the RA 9514, or the Revised Fire Code of the Philippines in 2008, seems to have been extremely helpful in reducing the incidence of fire in the country by establishing standards for structures and imposing penalties to those who do not comply or violate the sections in this law (Saputo & Sunarno, 2021). Along with that, the enactment of RA 6975 constituted the Bureau of Fire Protection, whose principal objective is to guarantee public safety by preventing and suppressing all types of destructive fires with the active participation of the citizens (Jaeger, 2020).

With all the information eloquently indicated, this study has been prompted to be made, focusing on the area of data analysis of the occurrence of fire incidents in between five years in the specific location of Ozamiz City. This research shall present the comparisons whether increased or reduced fire disasters in the said area.

## **2. Methods and Materials**

This study employed retrospective method of research. A retrospective study is a kind of research design where the researchers study a phenomenon by looking back at events that have already happened and then analyzing data which are already collected through scanning of the archives available in the Bureau of Fire Protection in Ozamiz City with the specific year focus from 2016-2021 in which the researchers believed to have the reliable and valid

data for the benefits of the study. It is looking at what is already in hand and applying statistical measures to it to describe the information in simpler way to provide better understanding and more efficient solution. Archival data refer to information that already exists in someone else's files. Originally generated for reporting or research purposes, it is often kept because of legal requirements, for reference, or as an internal record. In general, because it is the result of completed activities, it is not subject to change and is therefore sometimes known as fixed data. Some researchers make a distinction between archival and secondary data. They see archival data as information specifically collected for bureaucratic procedures and the like – applications, reports, etc. – that can then be made usable for other purposes. Secondary data refer to research information, collected as a result of studies and similar efforts, that can then be used by others either as comparison data or as part of new research. For the purposes of this section, we'll include both of these types of data in our discussion, and not distinguish between them. Archival data can exist almost anywhere that information is collected.

The study was conducted in Ozamiz City Bureau of Fire Protection Tinago which is located at Vicente Ostia Avenue, Ozamiz City, Misamis Occidental. Ozamiz is nearby the Zamboanga del Sur and Zamboanga del Norte provinces, while Lanao del Norte is across the bay. Ozamiz is 52 kilometres (32 mi) from Maria Cristina Falls, the main source of hydroelectric power in Mindanao. The city has a land area of 169.95 square kilometers or 65.62 square miles which constitutes 8.47 percent of Misamis Occidental's total area. Ozamiz City is located at latitude 8.1481 and longitude 123.8405 with coordinates of 8° 9' North, 123° 51' East and a postal code of 7200.

This study did not utilize participants as this is a retrospective study wherein the outcome of interest has already occurred and the data collected are from records. However, the data of interest of this study was provided by the Bureau of Fire Protection Officers of Ozamiz City. The data maybe ask from the Administrative Officer of the Ozamiz City Fire Department.

Existing records and information from the Bureau of Fire Protection's Office in Ozamiz City was utilized in this study. Gnu Regression, Econometrics and Time-series Library (Gretl) was also utilized in this study. These were the only tools utilized throughout the study as this study is retrospective in nature wherein the researchers main interest of the study are merely preexisting records.

The researchers sent a formal request letter to the adviser which was approved by said adviser. The researchers then sought the approval of the dean of the college of criminology. After the approval of the Dean of the College of Criminology the researchers then made another formal request letter to the Bureau of Fire Protection which they received and acknowledged. The researchers personally retrieved the data of interest for the study from the Ozamiz City Fire Department. The data retrieved from the Bureau of Fire Protection yielded four variables as namely: LPG, Lighted Cigarette, Open Flame, and Electrical.

Permission from the chief of the Bureau of Fire Protection through a formal letter was conducted by the researcher. The researcher adhere the guidelines set by the Republic Act No. 10173 known as the "Data Privacy Act of 2012". Through these, the researcher can assure the privacy and confidentiality of the data obtained.

The study utilized frequency, percentage, and time series analysis as statistical tools for data analysis in this study. Frequency refers to the number of times the value occurs in the data. Percentage is a number or ratio that can be

expressed as a fraction of 100. Time series analysis is a specific way of analyzing a sequence of data points collected over an interval of time.

### 3. Results and Discussions

This chapter presents the results and discussions of the study after obtaining the data from the Bureau of Fire Protection of Ozamiz City.

Table 1 shows the total percentage of all the recorded fire incidents in the city of Ozamiz within a five-year span. Based on the results of the table below, electrical fires are the predominant causes of fire incidents in Ozamiz City ranging from 2016 to 2021. Inversely, Liquefied Petroleum Gas (LPG) related fires have the least number of recorded cases in the same time stretch.

This implies that for a five-year stretch (2016-2021) most residents of Ozamiz City failed to observe caution when handling electrical equipment as this tallied the most cases. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 1.

**Table1.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2016-2021

Causes of Fire Incidents	Frequency	Percentage
Electrical	35	52.23
Open Flame	26	38.80
Lighted Cigarette	4	5.97
LPG	2	2.98
<b>Total</b>	<b>67</b>	<b>100.00</b>

Table 2 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2016. Based on the results of the table below, open flame related fires have generated the most number of cases whereas the lighted cigarette and LPG have generated the lowest number of cases. The cases of fire incidents for this year are similar to an incident which happened in South Africa, which tallied its highest number of open flame related incidents and have also recorded its lowest number of cases of lighted cigarette and LPG related fires in 2016 (Lavhelani, 2016).

This implies that for the year 2016 the residents of Ozamiz City failed to practice caution when keeping in check the amount of open flame sources within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 2.

**Table 2.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2016

Causes of Fire Incidents	Frequency	Percentage
Electrical	4	44.44
Open Flame	5	55.56

Lighted Cigarette	0	0
LPG	0	0
<b>Total</b>	<b>9</b>	<b>100.00</b>

Table 3 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2017. Based on the results of the table below, open flame related fires and electrical fires have generated the most number of cases whereas the LPG have generated the lowest number of cases. The cases of fire incidents for this year are similar to an incident which happened in Indonesia which tallied its highest number of open flame and electrical fire incidents in 2017 and also tallied its lowest number of cases of LPG fires (Asor, Jonardo, et al 2017).

This implies that for the year 2017 the residents of Ozamiz City failed to practice caution when keeping in check the amount of open flame sources, as well as mishandling electrical equipment within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 3.

**Table 3.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2017

Causes of Fire Incidents	Frequency	Percentage
Electrical	5	41.67
Open Flame	5	41.67
Lighted Cigarette	2	16.66
LPG	0	0
<b>Total</b>	<b>12</b>	<b>100</b>

Table 4 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2018. Based on the results of the table below, electrical fires have generated the most number of cases whereas the lighted cigarettes have generated the lowest number of cases. The cases of fire incidents for this year are similar to an incident which happened in that same year in Morocco which tallied its highest and lowest number of cases regarding electrical fire incidents and lighted cigarette related fires respectively (Asor, Jonardo et al., 2018). This implies that for the year 2018 the residents of Ozamiz City failed to practice caution when handling electrical equipment within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 4.

**Table 4.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2018

Causes of Fire Incidents	Frequency	Percentage
Electrical	7	53.85
Open Flame	5	38.46
Lighted Cigarette	0	0
LPG	1	7.69
<b>Total</b>	<b>13</b>	<b>100.00</b>

Table 5 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2019. Based on the results of the table below, electrical fires have generated the most number of cases whereas the LPG related fires have generated the lowest number of cases. The cases of fire incidents for this year are similar to an incident which happened in that same year in India, which tallied its highest and lowest number of cases regarding electrical fires and LPG related fires respectively (Tomar 2019).

This implies that for the year 2019 the residents of Ozamiz City failed to practice caution when handling electrical equipment within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 5.

**Table 5.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2019

Causes of Fire Incidents	Frequency	Percentage
Electrical	8	53.33
Open Flame	6	40
Lighted Cigarette	1	6.67
LPG	0	0
<b>Total</b>	<b>15</b>	<b>100.00</b>

Table 6 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2020. Based on the results of the table below, electrical fires have generated the most number of cases whereas the Lighted Cigarette and LPG related fires have generated the lowest number of cases. The cases of fire incidents for this year are similar to an incident which happened in that same year in Ghana, which tallied its highest number of cases of electrical fires and also tallied its lowest number of Lighted Cigarette and LPG related fires (Munyeza 2020).

This implies that for the year 2020 the residents of Ozamiz City failed to practice caution when handling electrical equipment within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 6.

**Table 6.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2020

Causes of Fire Incidents	Frequency	Percentage
Electrical	6	66.67
Open Flame	3	33.33
Lighted Cigarette	0	0
LPG	0	0
<b>Total</b>	<b>9</b>	<b>100.00</b>

Table 7 shows the frequency of all the recorded fire incidents in the city of Ozamiz in 2021. Based on the results of the table below, electrical fires have generated the most number of cases whereas the Lighted Cigarette and LPG related fires have generated the lowest number of cases. The cases of fire incidents for this year are similar to an

incident which happened in that same year in China, which tallied its highest number of cases of electrical fires and also tallied its lowest number of Lighted Cigarette and LPG related fires (Chen 2021).

This implies that for the year 2021 the residents of Ozamiz City failed to practice caution when handling electrical equipment within their respective domiciles/establishments. This implication is indicative of the data obtained from the Bureau of Fire Protection which was later given better and deeper interpretation in table 7.

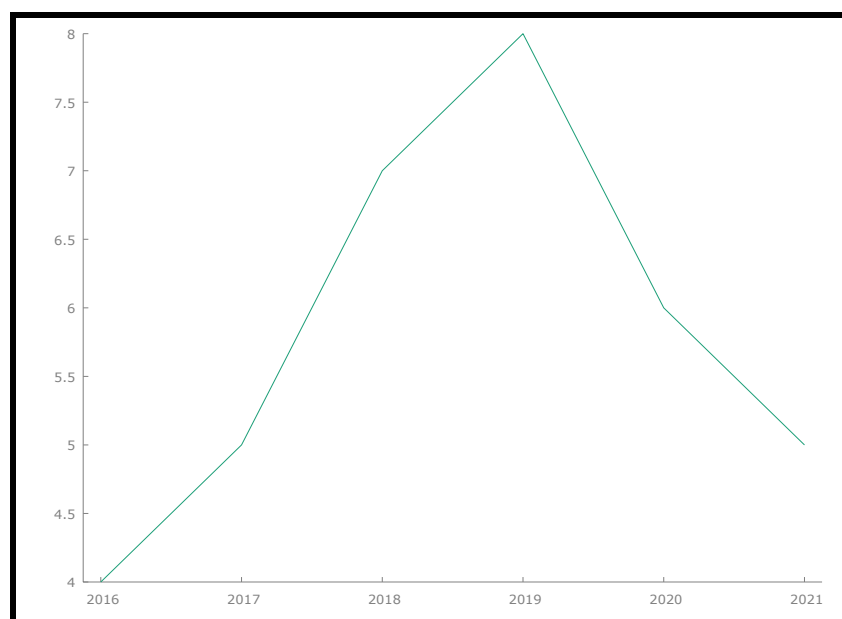
**Table 7.** Frequency and Percentage Distribution of Causes of Fire Incidents from 2021

Causes of Fire Incidents	Frequency	Percentage
Electrical	5	55.55
Open Flame	2	22.22
Lighted Cigarette	1	11.11
LPG	1	11.11
<b>Total</b>	<b>9</b>	<b>100.00</b>

### 3.1. Graphical Presentation of Electrical Related Cases

Electrical cases are the most common reasons of fire incidents in the city of Ozamiz. Electrical fires are defined as any failure or malfunction within the electrical components of equipment or machinery.

Figure 1 presents the trend analysis of the fire incidents in Ozamiz City from 2016 to 2021. Based on the results of the study, the highest number of fire incidents having electrical issues as the main reasons of the incidents, it is observed that 2019 has the highest number of incidents. The trend shows an increasing number of fire incidents wherein electrical issues is the main reasons from the year 2016 to 2019 but has steadily declined from 2020 to 2021.



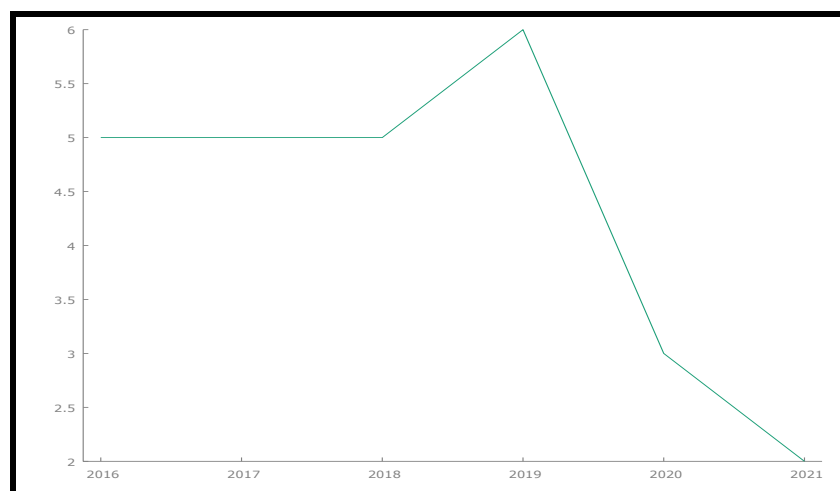
**Figure 1.** Trend Analysis of Electrical Related Fire Incidents in Ozamiz City from 2016-2021



### 3.2. Graphical Presentation of Open Flame Related Cases

Open Flame cases are one of the common reasons of fire incidents in the city of Ozamiz. Open flame means fire whose flame is supported by a wick, oil or other slow-burning means to sustain itself. “Open flame” includes, but is not limited to, flame producing devices such as candles, and torches.

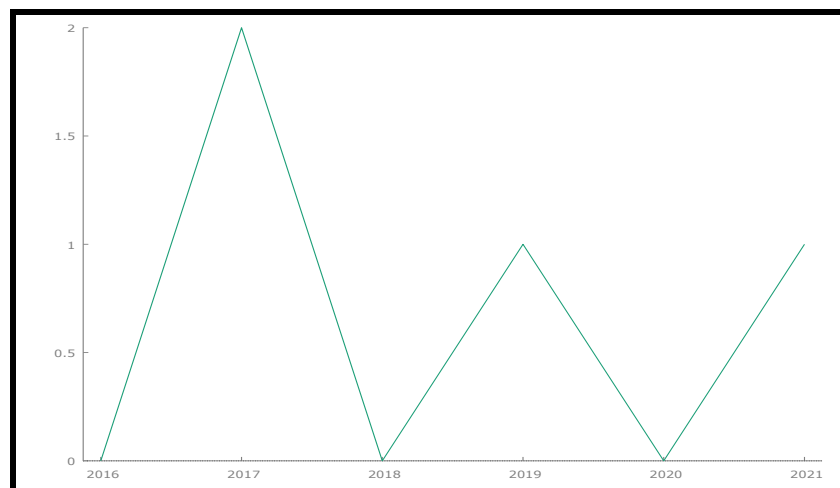
Figure 2 presents the trend analysis of the fire incidents in Ozamiz City from 2016 to 2021. Based on the results of the study, the highest number of fire incidents having open flame issues as the main reasons of the incidents, it is observed that 2019 has the highest number of incidents. The trend shows an increasing number of fire incidents wherein open flame issues is the main reasons from the year 2016 to 2019 but has steadily declined from 2020 to 2021.



**Figure 2.** Trend Analysis of Open Flame Related Fire Incidents in Ozamiz City from 2016-2021

### 3.3. Graphical Presentation of Lighted Cigarette Related Cases

Lighted cigarette cases are one of the common reasons of fire incidents in the city of Ozamiz. Lighted Cigarette means both tobacco that is under self-sustained combustion and tobacco that is heated to a point of smoking or vaporizing. A leading cause of smoking fire fatalities involves the person falling asleep or passing out with a lit cigarette.



**Figure 3.** Trend Analysis of Lighted Cigarette Related Fire Incidents in Ozamiz City from 2016-2021

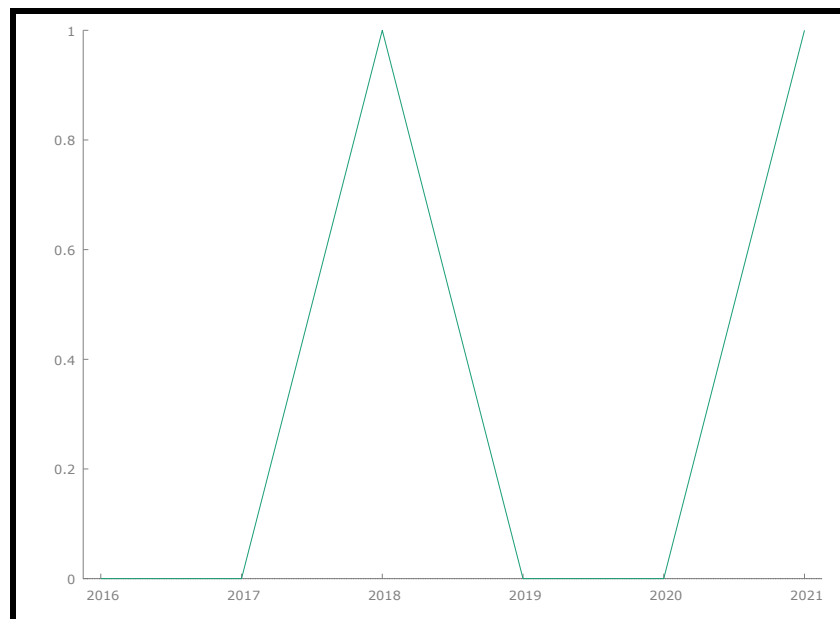


Figure 3 presents the trend analysis of the fire incidents in Ozamiz City from 2016 to 2021. Based on the results of the study, the highest number of fire incidents having lighted cigarette issues as the main reasons of the incidents, it is observed that 2017 has the highest number of incidents. The trend shows a sudden spike of lighted cigarette issues wherein 2016 had 0 then had a sudden spike of cases in 2017 with 2 then had a slump of cases in 2018 with 0 and 1 case in 2019 then another slump in 2020 with 0 and 1 case in 2021.

### 3.4. Graphical Presentation of LPG Related Cases

LPG cases are the least common reason of fire incidents in the city of Ozamiz. Liquefied petroleum gas (LPG) is a fuel gas made of petrol which contains a flammable mixture of hydrocarbon gases. LPG related fires are caused by accidental leakage from the gas tubes or explosion due to accumulated gas from the leakage.

Figure 4 presents the trend analysis of the fire incidents in Ozamiz City from 2016 to 2021. Based on the results of the study, the highest number of fire incidents having open flame issues as the main reasons of the incidents, it is observed that 2018 and 2021 have the highest number of incidents. The trend shows a sudden spike of lighted cigarette issues wherein 2016 to 2017 had 0 then had a sudden spike of cases in 2018 with 1 then had a slump of cases in 2019 to 2020 with 0 and in 2021 had yet another spike of 1 case.

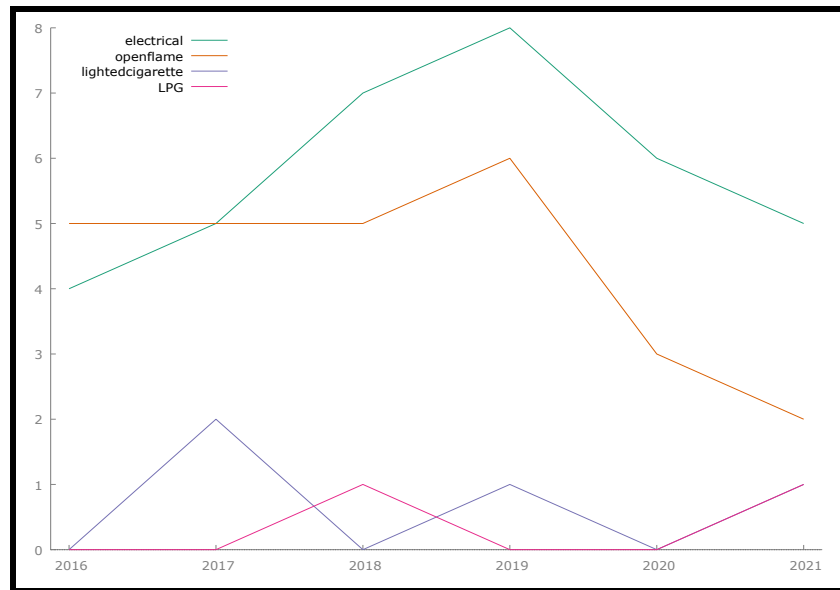


**Figure 4.** Trend Analysis of LPG Related Fire Incidents in Ozamiz City from 2016-2021

### 3.5. Graphical Presentation of the Predominant causes of Fire incidents in Ozamiz

Figure 5 presents the trend analysis of all the recorded fire incidents in Ozamiz City from 2016 to 2021. Among the common causes fire incidents in Ozamiz, the electrical fires obtained the highest number of recorded cases. And inversely the LPG related fires obtained the lowest number of recorded cases.

This implies that for a brief time stint dating from 2016 to 2019 cases of fire incidents were incrementally rising in terms of reported cases, this would suggest that within that time frame many residents failed to observe fire safety. However this trend would eventually decline from 2020 onwards due to residents being better educated and better trained in observing fire safety.



**Figure 5.** Trend Analysis of The Predominant causes of Fire incidents Ozamiz City from 2016-2021

#### 4. Conclusions and Recommendations

Based on the results of the study, we can conclude that electrical fires are the predominant cause of fire in Ozamiz City. This is due to multiple factors such as but not limited to; extension cords overheating, overloading circuits, faulty outlets and many others. These multiple cases of fires, which are electrical in its origin, leads to the conclusion that many residents in Ozamiz City do not observe caution when handling electrical equipment. However, in terms of handling LPG equipment, residents in Ozamiz City seem to take much better precaution when handling these said equipment, as it tallied the least number of cases throughout the same span of time.

It is recommended that the Bureau of Fire Protection of Ozamiz City conduct monthly seminars or programs regarding fire safety and fire prevention in the community. To the community of Ozamiz City, they should be cautious at all times, in leaving their individual homes, and avoid octopus connection to prevent shortage of electricity. Furthermore, it would be imperative that the personnel of the Bureau of Fire Protection of Ozamiz City conduct more frequent fire inspections in establishments in Ozamiz City.

#### Declarations

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##### Competing Interests Statement

*The authors declare no competing financial, professional and personal interests.*

##### Consent for publication

*Authors declare that they consented for the publication of this research work.*

##### Authors' Contributions

*All authors equally contributed in data collection, research and paper drafting.*

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